

The background of the entire page is a high-speed photograph of water splashing upwards, creating a dense, textured column of white droplets and foam against a solid blue background. The splash is centered and extends from the bottom to the top of the frame.

Volume 2

Chapter 1 Introduction



By making the right choices, regions diversify their water portfolios, make the right investments, and meet their water demands in 2030. Each region chooses an appropriate mix of resource management strategies based on its own water management objectives and goals. (DWR photos)

Chapter 1 *Introduction*

A resource management strategy is a project, program or policy that helps local agencies and governments manage their water and related resources. For example, urban water use efficiency is a strategy to reduce urban water use. A pricing policy or incentive for customers to reduce water use also is a strategy. New water storage to improve water supply, reliability and quality is another strategy.

Think of these strategies as tools in a tool kit. Just as the mix of tools in the kit will depend on the job, the combination of strategies will vary from region to region depending on climate, projected growth, existing water system, and environmental and social conditions. At the local level, it is important that the proposed strategies complement the operation of the existing water system. Some strategies may have little value in some regions. For example, because of geology, the opportunity for groundwater development in the Sierra Nevada is not nearly as significant as in the Sacramento Valley. Other strategies may have little value at certain times. For example, precipitation enhancement may not be effective during droughts.

A key objective of the California Water Plan is to present a diverse set of resource management strategies to meet the water related resource management needs of each region and statewide. Chapter 2 of Volume 1 describes the importance of regional planning and presents general considerations for preparing sustainable integrated resource plans suitable for each region's unique character. Volume 2 describes 25 resource management strategies (listed alphabetically in Box 1-1 and in the articles following the introduction) that can be combined in various ways to meet the water management objectives and goals of different regions and to achieve multiple benefits.

Resource managers need to examine all of these strategies to identify the best mix for their region. The more a region can diversify its portfolio, the more robust and resilient it will be in facing future unknowns.

Planning a Diversified Portfolio

As California changes, local agencies and governments continue to use different methods of managing water. Growing population, changing regulations, and evolving public attitudes and values are a few conditions that have influenced recent decisions about water.

Strategies are the tools that local agencies and governments should consider when they plan. The basic intent is to prepare good plans that are diversified, satisfy regional and state needs, meet multiple objectives, include public input, address environmental justice, mitigate impacts, protect public trust assets, and are affordable. Additional recommendations for planning and implementation can be found in Chapter 5 of Volume 1.

While the strategies are based on the best available information, Department of Water Resources (DWR) has not conducted detailed studies to verify this information on a statewide basis because the performance of individual strategies will depend on how they are combined and used in each region. DWR, with the help of an Advisory Committee, is developing a plan for more comprehensive data and analytical tools for use in the next Water Plan Update.

Additional analyses (described in Chapter 4 of Volume 1) will provide policymakers and resource managers more quantitative information on the performance of various strategies, interactions between strategies, tradeoffs, and potential groupings of strategies. DWR will consider several different future scenarios in future Water Plan Updates that can be used by planners to test the performance of alternative strategy mixes (see Chapter 4 of Volume 1).

Organization of Resource Management Strategy Chapters

While the chapters were written by different experts, the narratives for each strategy are organized similarly. Each includes:

- A short definition and background material on the strategy.
- A section on the current use of the strategy in California provides an overview of what is happening today.
- A section on benefits includes a discussion on how much water, demand reduction, ecosystem restoration, or other benefits could be achieved statewide by 2030. Since the application of these strategies can vary widely among regions, the strategy descriptions are from a broader, statewide perspective. More detailed information on some of the strategies is also presented in the Reference Guide (Volume 4).
- Estimates on implementation costs when available. In most cases, costs are highly dependent on where they are done and can only be estimated in broad ranges in these brief narratives.
- The tradeoffs and challenges associated with implementing each strategy. Each strategy narrative includes a summary of major issues facing the strategy. For instance, with ocean water desalination there are issues with water intakes and brine disposal.
- Recommendations on how the strategy could be implemented over the next 25-30 years to minimize its

impacts, as well as how to promote additional implementation. Many of the recommendations are for the State to enact technical support to help regional groups make better decisions in the use of the strategies. The narratives do not include specific recommendations for funding of individual strategies since local and regional efforts will need to complete additional analysis before making decisions to proceed with strategies. General recommendations that would apply to all strategies are presented in Chapter 5 of Volume 1 rather than in the individual strategy narratives. Common recommendations include the need for monetary investment and consideration of public trust, environmental justice, and environmental impacts.

While the resource management strategies are presented individually, they can complement each other or there may be trade-offs between strategies to be considered. For instance, water from a recycling project could contribute to ecosystem restoration and groundwater recharge, while water use efficiency might reduce the opportunity for recycling and reuse.

In addition, the strategy narratives recognize the relationship of water and other resources. However, DWR does not have authority over some of these resources. As appropriate, these policies and programs are articulated in the various resource management strategy narratives.

Box 1-1 Resource Management Strategies

Agricultural lands stewardship
Agricultural water use efficiency
Conjunctive management and groundwater storage
Conveyance
Desalination
Drinking water treatment and distribution
Economic incentives (Loans, Grants, and Water Pricing)
Ecosystem restoration
Floodplain management
Groundwater remediation/Aquifer remediation
Matching water quality to water use
Pollution prevention

Precipitation enhancement
Recharge areas protection
Recycled municipal water
Surface storage-CALFED
Surface storage-regional/local
System reoperation
Urban land use management
Urban runoff management
Urban water use efficiency
Water-dependent recreation
Watershed management
Water transfers

Other resource management strategies (includes crop idling for water transfers, dewvaporation, fog collection, irrigated land retirement, rainfed agriculture and water bag transport/storage technology)

Strategy Summary Table

The Strategy Summary Table is a one-page overview of the 25 resource management strategy articles. The data and information presented in Table 1-1 and the Volume 2 strategy narratives were developed by DWR in consultation with other experts and stakeholders. The actions in the table are grouped by resource management strategies (top section) and essential support activities (bottom section), such as planning and research and development. The table presents the resource management strategies in subgroups, which include demand reduction, operational efficiency and transfers of water, water supply, water quality, and resource stewardship. Table columns include:

- **Left column** – shows the *Resource Management Strategies* (top section) and *Essential Support Activities* (bottom section) that are available to regions to achieve various water management objectives.
- **Center columns** – show *Water Management Objectives* that could be achieved by implementing a particular strategy. The table shows dots (•) where the resource management strategy articles indicate that the strategies could have direct and significant benefits for various water management objectives. Note that most resource management strategies can help achieve multiple water management objectives.
- **Right column** – shows a range of *Cumulative Costs for each Option by 2030* of implementing a strategy or performing a support activity to achieve the indicated benefits by 2030 (not including ongoing operation and maintenance costs). Note that the costs in the table are displayed as the cumulative sum (over about 25 years in 2005 dollars) of expected costs by year 2030. Backup for each cost estimate are contained in the strategy narratives. Details on implementation and financing are presented in Chapter 5 of Volume 1.

The dot placement can be viewed either horizontally for a given resource management strategy or vertically for a given water management objective. As shown (vertically) in the table, most of the resource management strategies can provide water supply benefits. Likewise, many strategies can contribute to improved water quality, environmental benefits and other water management objectives.

While most of the resource management strategies have the potential to contribute to multiple water management objectives, any individual site-specific project or program within a resource management strategy may contribute to only one, or a few of the objectives. For example, it is unlikely that the agricultural land stewardship practices on a single farm will

contribute to all the water management objectives (as indicated in Table 1-1). In aggregate, however, the combined agricultural land stewardship practices on many farms can contribute to all the water management objectives as shown in the table.

As part of the strategy narratives, DWR prepared preliminary estimates of water supply benefits which can include water supply increases and water demand reductions. Those estimates are shown as ranges in Figure 1-1 for some of the management strategies. The figure shows that there is considerable capacity to provide water supply benefits between the eight strategies included in the figure. In some cases, the values represent a local or regional benefit and may not provide statewide benefits. In addition, implementing some strategies, like water dependent recreation or ecosystem restoration may increase total water demands. Many strategies were not included in the figure because their potentials for additional water supply are either incidental (small), or have not yet been estimated. Supply benefits will be better quantified during the subsequent water plan update. Some strategies do not produce water supply benefits.

The information and data in Table 1-1, Figure 1-1 and the Volume 2 strategy narratives should be treated as preliminary indicators of the scale and type of potential benefits and associated costs. In most cases, assumptions and methodologies are unique to given strategies and neither benefits nor costs are additive among different strategies. The costs, benefits, and negative impacts of actually implementing these strategies in real-world locations could vary significantly depending upon local factors and project-level complexities. Project-level considerations include the extent of the management strategies already incorporated into the existing system, proposed location of new strategies, operations, mitigation, system integration, presence of cultural or environmental resources. Therefore, local and regional water management efforts should develop their own estimates of costs, potential benefits, as well as other tradeoffs associated with application of any particular strategy.

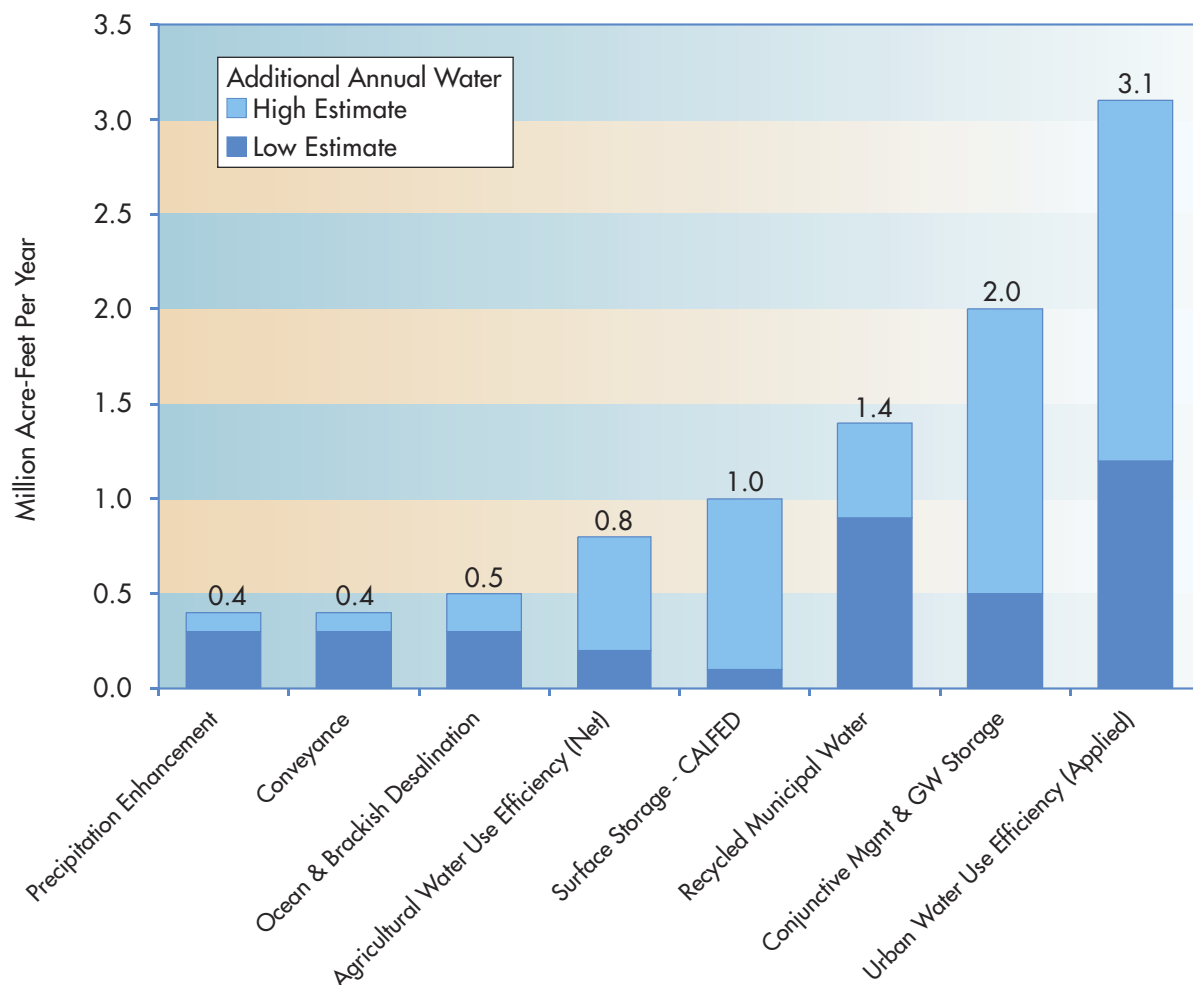
The table can help guide selective reading of the following 25 chapters.

Table 1-1 Strategy summary table

	Water Management Objectives									Cumulative Cost of Option by 2030 (\$ Billion) See narratives for backup
	Provide Water Supply Benefit	Improve Drought Preparedness	Improve Water Quality	Operational Flex & Efficient	Reduce Flood Impacts	Environmental Benefits	Energy Benefits	Recreational Opportunities	Reduce GW Overdraft	
Resource Management Strategies										
Reduce Water Demand										
Agricultural Water Use Efficiency	•	•	•	•		•	•		•	0.3 - 4.0
Urban Water Use Efficiency	•	•	•	•		•	•			2.5 - 6.0
Improve Operational Efficiency & Transfers										
Conveyance	•	•	•	•	•	•	•	•	•	0.2 - 2.4
System Reoperation	•	•	•	•	•	•		•		
Water Transfers		•	•	•		•				
Increase Water Supply										
Conjunctive Management & Groundwater Storage	•	•	•	•	•	•			•	1.5 - 5.0
Desalination - Brackish	•	•	•	•					•	0.2 - 1.6
-- Seawater	•	•	•	•					•	0.7 - 1.3
Precipitation Enhancement	•	•					•			0.2
Recycled Municipal Water	•	•	•	•		•	•	•	•	6.0 - 9.0
Surface Storage - CALFED	•	•	•	•	•	•	•	•	•	0.2 - 5.6
Surface Storage - Regional/Local	•	•	•	•	•	•		•	•	
Improve Water Quality										
Drinking Water Treatment and Distribution			•							17.0 - 21.0
Groundwater/Aquifer Remediation	•	•	•						•	20.0
Matching Quality to Use	•	•	•							0.1
Pollution Prevention			•			•		•		15.0
Urban Runoff Management	•	•	•		•	•		•	•	
Practice Resource Stewardship										
Agricultural Lands Stewardship	•	•	•	•	•	•	•	•	•	5.3
Economic Incentives (Loans, Grants, and Water Pricing)	•	•	•	•		•			•	
Ecosystem Restoration	•			•	•	•		•		7.5 - 11.3
Floodplain Management				•	•	•		•		0.5
Recharge Areas Protection	•	•	•		•				•	
Urban Land Use Management	•		•		•	•		•	•	
Water-Dependent Recreation								•		3 - 6% of total
Watershed Management	•	•	•		•	•			•	0.5 - 3.6
Other Resource Management Strategies Objectives vary by strategy (see narratives in remainder of Volume 2)										
Essential Support Activities to Integrate Strategies and Reduce Uncertainty										
The following support activities are essential for successfully integrating packages of these resource management strategies. Compared with the costs of implementing the resource management strategies, the costs are relatively small for the essential support activities shown below (see Chapters 2 and 4 of Volume 1).										
Regional Integrated Resource Planning & Management										0.25
Statewide Water Planning										0.17
Data & Tool Improvement										0.25
Research & Development										0.25
Science										3 - 5% of total

The resource management strategy estimates are not additive. Although presented individually, they are in most cases alternatives that will either complement each other or compete for limited system capacity, funding, water supplies or other component necessary for implementation.

Figure 1-1 Range of additional annual water for eight resource management choices



This graph shows the potential range of more water demand reduction and supply augmentation each year for eight resource management strategies. Low estimates are shown in the lower (dark blue) section of each bar. The water supply benefits of the resource management strategies are not additive. As presented here, urban water use efficiency includes reduction in both consumptive and non-consumptive uses (or applied water), whereas agricultural water use efficiency only includes reduction in consumptive uses (or net water).